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## Using deep learning to identify diabetic retinopathy in Saudi Arabia

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**Background:** Diabetic Retinopathy (DR) is an eye condition affecting the blood vessels in the retina that can cause vision loss and blindness in diabetic patients [1]. In its early stages, DR has no symptoms, and the majority of patients only realize they have DR once it starts affecting their vision, in later stages of severity. There is no current model built to identify and diagnose DR in Saudi Arabia.
**Objectives:** Using deep learning algorithms to build and validate a model to identify diabetic retinopathy among Saudi population.
**Methodology:** A sample dataset was obtained from King Khaled Eye Specialist Hospital, a large specialist hospital in Riyadh, Saudi Arabia. The dataset consists of labeled standard fundus photography collected in a period from 2003 to 2020. Transfer learning has been applied in this study to develop the deep learning model to classify the images.

The dataset is composed of 22,341 images, split into training, testing, and validation with a 75:15:15 ratio. The images were preprocessed in terms of color, by mapping it to 50% grayscale, and resizing it to 224 * 224 * 3. When an image is received it is fed into the fundus detector to eliminate any irrelevancies, then it goes into the DR classifier for detection between the four stages: No DR, Mild DR, Moderate DR, Severe DR, and Non-Proliferative DR. To increase the size of the training set, a labeling tool was built to allow equipped practitioners to diagnose a corpus of collected unlabeled images.
**Results:** The automated fundus detector, which is built to ensure every image fed into the classifier for diagnosis is an appropriate image of a fundus, has achieved an accuracy and recall of 99.20%. As for the classifier, it has achieved an accuracy of 68.19% and recall of 39.54% in differentiating between the five different classes, and 67.86% accuracy and 61.98% recall in determining whether or not the fundus is healthy.

In addition to the above models, a labeling tool was built, equipped with a one-click functionality to facilitate and speed up the process of collecting training images to periodically enhance the performance of the model. (Figure 1)
**Discussion and Conclusion:** This project is the first of its kind in the Kingdom, and it is still in the early stages of development. The aim is for the recall of the classifier to reach 94%, and through our collaboration with King Khaled Eye Specialist Hospital we are confident that we can achieve these results.
**Keywords:** Diabetic Retinopathy, Diabetes, Fundus.

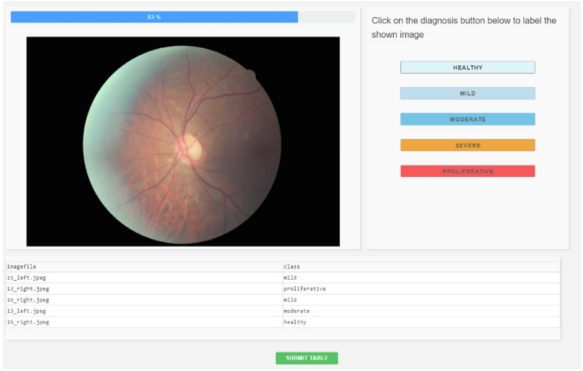


**Fig. 1.** Labeling tool

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## Machine learning models for predicting diagnosis or prognosis of COVID-19: A systematic review

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**Background and Motivation:** Although reverse transcriptase polymerase chain reaction (RT-PCR) remains the gold-standard for diagnosis of COVID-19, many researchers suggest exploring alternative machine learning (ML) solutions, especially in low resource settings [1,2,3]. Few studies provide a systematic summary of such models and their utility in diagnosis or prognosis of COVID-19. Providing a comprehensive appraisal of such decision support systems and their use in COVID-19 management can aid the medical community in utilizing such models for making informed decisions at the time of risk-assessment of their patients.

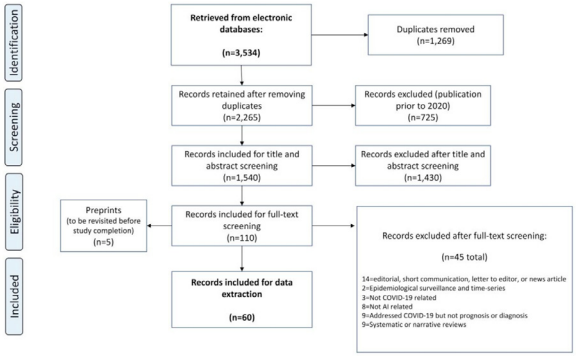


**Figure 1.** Preferred reporting items for systematic reviews and meta-analysis (PRISMA) flow-chart for studies included and excluded

**Objectives:** The objective of this study was to review studies that predicted diagnosis of COVID-19 or predicted severity of the disease using machine learning models.
**Methodology:** Following the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA), we conducted a literature search of Medline (Ovid), Scopus, Embase and IEEE Xplore, from January 1 to June 31, 2020. Outcomes of interest were COVID-19 diagnosis or prognostic measures such as death, need for mechanical ventilation, admission, acute respiratory distress syndrome. We included peer-reviewed observational studies, clinical trials, research letters, case-series and case-reports addressing the use of ML for prediction. All records were screened by two authors independently. Eight authors extracted data, such that data from the same record were extracted independently by two authors. These data included the study's country and setting, sample size, data source, dataset used, diagnostic and/or prognostic outcomes, prediction measures, type of ML model and measures of diagnostic accuracy. Bias was assessed using the ROBINS-1 tool [4]. This study was registered in PROSPERO (CRD42020197109).
**Results:** The final records included for data extraction were 60 [Figure 1]. Fifty studies (83.3%) relied on chest imaging for prediction, while the remainder used laboratory indicators for prediction. Only five studies predicted severity, while the rest predicted diagnosis. The most common class of ML models used was deep learning, and convolutional neural networks in particular. Many studies used or built on pretrained ML models. All studies used RT-PCR as the diagnostic standard. Twenty-one studies (35%) used open source datasets. Most of the studies reported high sensitivity, specificity, and accuracy for the ML models. Data extraction is still ongoing.
**Discussion and Conclusion:** ML is useful for identifying COVID-19 patients, particularly in the context of chest imaging. This is less expensive and more accessible than RT-PCR in low-resource settings. Compared to previous systematic reviews, our study provides a more comprehensive description of ML models and their use in COVID-19 diagnosis or prognosis [5,6,7]. We encourage physicians to utilize such models and test their diagnostic accuracy among their patient populations.

**Keywords:** COVID-19, SARS-CoV-2, Machine Learning, Artificial Intelligence, Prediction, Saudi Arabia

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## Qualitative Research Methodology in Healthcare Workshop

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**Background:** Qualitative Research is gaining popularity as it provides evidence to research. In qualitative research, researchers would like to explore a phenomena in depth using textual data, images and documentation instead of numbers. Using techniques like interview and focus group, researcher will need to analyze a voluminous textual and documentation data to derive to solution to the phenomena. Atlas.ti software is one of the well-known computed assisted qualitative data analysis software (CAQDAS) available for scientific analysis. In this workshop, we will explain how researcher can conduct qualitative research in healthcare from research design, data collection and data analysis using Atlas.ti.
**Participants:** Any healthcare professionals/academicians who are interested to learn about qualitative research can participate in this workshop. Minimal requirements: Postgraduate level.
**Content**
**Relevance to HIMSS Saudi Arabia 2020**

As we are progressing in Health IT deployment in healthcare organizations, the ability to conduct qualitative research can assist in understanding the users of the technology and to provide evidence in research. Qualitative research is a must knowledge for providers and practitioners so that they can evaluate the evidence available in the literature.
**Learning Objectives:**
**At the end of this workshop, participants will be able to:**

- Understand the fundamentals of qualitative research
- Be aware what is research design
- Know what is the qualitative methods: Interview and Focus group